

CLAIMS

1. Apparatus for transferring settled or suspended solids from an open vessel into a closed vessel, the apparatus
5 comprising a suction line which extends from the closed vessel to the open vessel via drive means, such as a pump or compressor, and a solids feed line which extends from a solids outlet in the open vessel to a solids inlet in the closed vessel, a fluidising apparatus being provided to
10 fluidise the solids in the open vessel.
2. Apparatus as claimed in claim 1, in which the fluidising apparatus comprises a flow chamber having a fluid inlet and a fluid outlet, means for establishing a
15 swirling or coanda flow in a fluid passing out of the fluid outlet, and a transport outlet for transporting fluidised material away from the flow chamber.
3. Apparatus as claimed in claim 2, in which the transport
20 outlet is situated externally of the flow chamber.
4. Apparatus as claimed in claim 2 or 3, in which the transport outlet is situated directly above the flow chamber.
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5. Apparatus as claimed in any one of claims 2 to 4, in which the transport outlet is situated close to the flow chamber.
- 30 6. Apparatus as claimed in any one of the preceding claims, in which means is provided for controlling the rate at which solids are transferred from the open vessel into the closed vessel.

7. Apparatus as claimed in claim 6, in which the means comprises a flow meter which measures the rate of flow of suspended solids.
- 5 8. Apparatus as claimed in any one of the preceding claims, in which the closed vessel comprises a feed vessel which feeds suspended solids into a transport vessel containing a fluidising unit.
- 10 9. Apparatus as claimed in claim 8, in which the transport vessel comprises a solids outlet through which suspended solids are discharged at a controlled rate along a slurry discharge line.
- 15 10. Apparatus as claimed in claim 9, in which means are provided on the slurry discharge line for measuring the flow rate of slurry discharge.
- 20 11. Apparatus as claimed in claim 9 or 10, in which a bypass line is provided to allow fluid from the open vessel to bypass the fluidising unit and to pass directly into the slurry discharge line to control slurry concentration.
- 25 12. Apparatus as claimed in claim 11, in which a valve is provided in the bypass line.
- 30 13. Apparatus as claimed in any one of claims 9 to 12, in which an ultrasonic unit is disposed in the slurry discharge line.
- 35 14. Apparatus as claimed in any one of the preceding claims, in which means are provided for controlling the flow rate and/or concentration of suspended solids from the open vessel into the closed vessel based on the flow rate and/or concentration of suspended solids from the transport

vessel, so that the solids content of the transport vessel is maintained at a substantially constant level.

15 15. Apparatus as claimed in claim 14, in which the flow rate of suspended solids from the open vessel to the closed vessel and the rate of discharge of suspended solids from the transport vessel are controlled by means of valves.

10 16. Apparatus as claimed in claim 15, in which the valves are controlled by a computer, dependent on input from flow meters.

15 17. Apparatus as claimed in claim 16, in which the flow meters are mass flow meters.

18. Apparatus as claimed in claim 17, in which the flow meters are coriolis or ultrasonic meters.

20 19. A method for transferring settled or suspended solids from an open vessel into a closed vessel, the method comprises the steps of:

- (a) drawing fluid from the closed vessel into the open vessel;
- (b) operating a fluidising unit with the said fluid to fluidise the settled or suspended solids; and
- (c) drawing the fluid and fluidised solids from the open vessel into the closed vessel.

30 20. A method as claimed in claim 19, in which the fluid is drawn from the closed vessel to the open vessel by means of a pump or compressor.

35 21. A method as claimed in claim 19 or 20 in which the fluid is recirculated between the closed vessel and the open vessel, so that no additional fluid is added to or removed from the system.

22. A method as claimed in any one of claims 19 to 21 further comprising the step of:

- 5 (d) controlling the rate of discharge of the fluid and fluidised solids from the closed vessel into a discharge vessel, so that a desired concentration of solids is discharged from the discharge vessel.

23. A method as claimed in claim 22 in which the
10 concentration of solids discharged from the discharge vessel is maintained at a constant rate.

24. A method as claimed in any one of claims 19 to 23, in which the step of controlling the rate of discharge of
15 solids from the closed vessel to the discharge vessel is achieved by controlling a valve on a pipe connecting the closed vessel to the discharge vessel.

25. A method as claimed in any one of claims 22 to 24,
20 further comprising the step of fluidising the solids in the discharge vessel.

26. A method as claimed in any one of claims 19 to 25, in which no fluid other than the fluid in the open vessel is
25 used to fluidise and transport the settled and suspended solids from the open vessel to the closed vessel.

27. A method as claimed in any one of claims 19 to 26, in which no fluid other than the fluid in the open vessel is
30 used to transport solids from the closed vessel to the discharge vessel.

28. A method as claimed in any one of claims 19 to 27, which is adapted to operate below sea level to remove
35 contaminated material from the seabed and to hydro hoist

this material to a receiving ship or barge for treatment or transportation to the shore.

29. A method as claimed in any one of claims 19 to 27
5 adapted to remove material from the seabed for the purposes of dredging or the mining/retrieval of valuable elements.

30. A method as claimed in any one of claims 19 to 27
adapted for the removal of radioactive waste solids from
10 storage ponds and tanks.

31. A method as claimed in any one of claims 19 to 27 for
use in conveying material deposited at the base of a mine
shaft to a transport vessel and hydro transporting that
15 material to the surface.

32. A method as claimed in any one of claims 19 to 27 for
use in conveying a material directly into the suction line
of a slurry pump at concentrations and/or pressures matched
20 to the pump's characteristics in order to maximise its
efficiency.